

WHAT IS CLAIMED IS:

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1. A magnetic disk, comprising a magnetic layer, a protective layer, and a lubricating layer coatd at least on one surface of a flexible support member, wherein the protective layer contains at least carbon, hydrogen and nitrogen.
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2. A magnetic disk comprising a magnetic layer, a protective layer, and a lubricating layer coatd at least on one surface of a flexible support member or a rigid support member, wherein the protective layer contains at least carbon, hydrogen, nitrogen and rare gas elements.
3. A magnetic disk according to claim 1 or 2, wherein nitrogen content of the protective layer is 0.5 - 8.0 atom %.
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4. A magnetic disk according to claim 1 or 2, wherein hydrogen content of the protective layer is 25 - 35 atom %.
5. A magnetic disk according to claim 1 or 2, wherein carbon content in the protective layer is 60 - 70 atom %.
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6. A magnetic disk according to claim 2, wherein rare gas content in the protective layer is 0.5 - 1.2 atom %.
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7. A method for manufacturing a magnetic disk, comprising the steps of forming a magnetic layer at least on one surface of a flexible support member or a rigid support member, and forming a protective layer on surface of the magnetic layer by plasma CVD method using a mixed gas of hydrocarbon, nitrogen and rare gas elements under application of negative bias voltage on the magnetic layer.
8. A method for manufacturing a magnetic disk

according to claim 7, wherein the magnetic layer is formed by sputtering method.

9. A magnetic recording mode using a floppy disk, wherein the floppy disk is used as a magnetic recording medium, said floppy disk comprising a ferromagnetic thin film and a carbon protective layer coated at least on one surface of a flexible support member, and a magnetic signal is recorded and reproduced by a floppy disk device with a carbon protective layer provided on surface of a head or a slider.

10. A magnetic recording mode using a floppy disk according to claim 9, wherein hardness of the carbon protective layer of the floppy disk is lower than hardness of the carbon protective layer on the surface of the head or the slider.

11. A magnetic recording mode using a floppy disk according to claim 9, wherein micro-hardness of the carbon protective layer of the floppy disk is within the range of 20 - 40 GPa, micro-hardness of the carbon protective layer on the surface of the head or the slider is 30 GPa or more, and hardness of the carbon protective layer on the floppy disk is lower than hardness of the carbon protective layer on the surface of the head or the slider.

12. A magnetic recording mode using a floppy disk, wherein a floppy disk is used as a magnetic recording medium, said floppy disk having a ferromagnetic metal thin film at least on one surface of a flexible support member and comprising a carbon protective layer containing at

least carbon, hydrogen and nitrogen coated on a ferromagnetic metal thin film, and a magnetic signal is recorded and reproduced by a floppy disk device having a carbon protective layer on the surface of the head or the slider.

13. A magnetic recording mode using a floppy disk according to claim 12, wherein hydrogen content in the carbon protective layer of the floppy disk is 25 - 35 atom %, and nitrogen content is 0.5 - 8.0 atom %.

14. A magnetic recording mode using a floppy disk according to claim 12, wherein the carbon protective layer of the floppy disk contains at least carbon, hydrogen, nitrogen, and rare gas elements.

15. A magnetic recording mode using a floppy disk according to claim 12, wherein the carbon protective layer of the floppy disk contains at least carbon, hydrogen, nitrogen, and rare gas elements, hydrogen content is 25 - 35 atom %, nitrogen content is 0.5 - 8.0 atom %, and rare gas content is 0.5 - 1.2 atom %.

16. A magnetic recording mode using a floppy disk according to claim 12, wherein micro-hardness of the carbon protective layer of the floppy disk is within the range of 20 - 40 GPa, micro-hardness of the carbon protective layer on the surface of the head or the slider is 30 GPa or more, and hardness of the carbon protective layer of the floppy disk is lower than hardness of the carbon protective layer on the surface of the head or the slider.

17. A magnetic recording mode using a floppy disk,

wherein the floppy disk is used as a magnetic recording medium, said floppy disk comprising a ferromagnetic metal thin film at least on one surface of a flexible support member and having a carbon protective layer containing at least carbon, hydrogen and nitrogen on the ferromagnetic metal thin film, and a magnetic signal is recorded and reproduced on a floppy disk device having a carbon protective layer containing at least carbon and hydrogen on the surface of the head or the slider.

10        18.    A magnetic recording mode using a floppy disk according to claim 17, wherein hydrogen content in the carbon protective layer of the floppy disk is 25 - 35 atom %, and nitrogen content is 0.5 - 8.0 atom %.

15        19.    A magnetic recording mode using a floppy disk according to claim 17, wherein the carbon protective layer of the floppy disk contains at least carbon, hydrogen, nitrogen, and rare gas elements.

20        20.    A magnetic recording mode using a floppy disk according to claim 17, wherein the carbon protective layer of the floppy disk contains at least carbon, hydrogen, nitrogen, and rare gas elements, hydrogen content is 25 - 35 atom %, nitrogen content is 0.5 - 8.0 atom %, and rare gas content is 0.5 - 1.2 atom %.

25        21.    A magnetic recording mode using a floppy disk according to claim 17, wherein micro-hardness of the carbon protective layer of the floppy disk is within the range of 20 - 40 GPa, micro-hardness of the carbon protective layer on the surface of the head or the slider is 30 GPa or more,

and hardness of the carbon protective layer of the floppy disk is lower than hardness of the carbon protective layer on the surface of the head or the slider.